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CENTRE FOR DEVELOPMENT
AND ENVIRONMENT

Centre for Development and Environment

SPOTLIGHT ON THE ROLE OF SOILS IN SUSTAINABLE DEVELOPMENT

ANNUAL REPORT 2014

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Cover photo: CDE's research helps to preserve the fundamental role of soils in natural ecosystems, agriculture, and food security and works to advance sustainable land use and improve human well-being. Aerial view of maturing rice fields in Uruguay. Photo: Guillermo Robles/Corbis

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A word from the President of CDE's Board

Urs Wiesmann
President of CDE Board

Dear Reader,

During my sabbatical in the spring of 2014, I had the opportunity – together with CDE, our local research partners, and the Kenya National Bureau of Statistics – to complete and present to the Kenyan government the high-resolution Socio-Economic Atlas of Kenya. *The atlas is now highly regarded by development workers and decision-makers at many levels. It reveals important development indicators at a spatial resolution corresponding to Kenya's over 7,000 sub-locations. These indicators include population composition, levels of poverty and well-being, education and employment, water and energy supply, and more. But I would like to highlight two observations in particular, which emerged from our collaborative analysis of the atlas data and work with our partners.*

First, rural areas and agricultural structures are changing faster than generally assumed, and centre–periphery patterns are gaining importance. Many new types of rural areas are emerging: for example, some are undergoing rapid agricultural modernization, while in others agriculture plays a secondary role. Similar trends are occurring across the global South. Among other things, this implies that the key role of soil resources in sustainable development is undergoing significant change. I am happy to say that CDE is facing the challenges of this change in an innovative way, as indicated by the research and implementation activities highlighted in the present annual report.

Second, implementing research for development strongly depends on actors' ability to incorporate scientific findings in concrete negotiations and decision-making processes. This implies that a critical mass of well-educated people must be attained to enable independent, knowledge-based development decisions. Such a critical mass is also needed to strengthen the South's position in key global debates, including negotiations over the United Nations' Sustainable Development Goals. Research partnerships that combine tertiary education and development-oriented research are central instruments in promoting these knowledge competences. I am therefore pleased to highlight CDE's strong showing in the new Swiss Programme for Research on Global Issues for Development (r4d Programme). And I wish to thank the Swiss Agency for Development and Cooperation and the Swiss National Science Foundation for supporting ongoing development-oriented research partnerships through this long-term programme.

I wish you an engaging read!

Urs Wiesmann, President, CDE Board

The Centre for Development and Environment (CDE) is an interdisciplinary research centre of the University of Bern. CDE's overarching goal is to produce and share knowledge for sustainable development in cooperation with partners in the global North and South.

Vision

We believe that knowledge is key to concrete progress towards sustainable development. In this respect development-oriented research plays a crucial role, as it promotes innovative thinking and mutual learning within and beyond the realm of science.

Mission and Goal

Our mission is to produce and share knowledge for sustainable development in cooperation with partners in the global North and South. Our goals are to understand the effects of global change on natural resources and people's lives; develop and disseminate context-specific and multi-sectoral innovations; and, through education, promote learning for and from sustainable development.

Values

We adhere to the values of inter- and intra-generational equity inherent in the common definition of sustainable development, while working towards progress in all three dimensions of sustainability – environmental, social, and economic. We support and build capacity through equal partnerships and intercultural respect. As an interdisciplinary research centre, we build on the commitment and specific capacity of all partners and on the additional value created through trust-based collaboration and mutual learning.

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Introduction

Peter Messerli and Thomas Breu

Peter Messerli

Thomas Breu

> “The University of Bern will be offering a gapless course of studies in sustainable development across all levels”

Creation of our annual report is always an important occasion for us at CDE. Not only does it hold us to account opposite our steering committee and funders, it also provides us with a welcome opportunity to share our activities and exchange experiences with the public and our partners in Switzerland and internationally. Lastly, it also gives CDE’s management a valuable moment to pause and reflect. This moment enables us to gain foresight, taking a look back in order to look forward. Allow us to describe just a few of our reflections.

Year one of CDE’s new mandate from the University of Bern

In 2014, CDE began its new four-year university performance mandate. It comprises 15 goals covering our whole range of activities, thus enabling coherent planning and reporting. At the same time, our mandate is embedded in the University of Bern’s *Strategy 2021,* offering us a valuable degree of continuity and stability for planning purposes. One of CDE’s core tasks, assigned to us following discontinuation of the Interdisciplinary Centre for General Ecology (IKAÖ), is that of overseeing education for sustainable development at the university. Following the successful launch of our bachelor’s-level minor, which has attracted over 200 students, we have begun designing a master’s-level minor that is slated to start in 2015. This will enable the University of Bern to offer a gapless course of studies in sustainable development spanning all levels, from bachelor’s- and master’s-level programmes to doctoral studies – within the International Graduate School (IGS) North-South – as well as our postgraduate certificate in sustainable development. As part of our university mandate, CDE supports the Vice-Rectorate Quality in incorporating sustainability perspectives in all courses of study at the University of Bern. Of course, we rely on effective partnerships within the university to implement this challenging mandate. We are therefore very pleased to have the assistance of five affiliated professorships in geography, social anthropology, sociology, and biology, and to receive the active support of seven CDE member institutions from four faculties. Our new tasks have also led to staff changes within the CDE team. Thanks to support from a new working group for equality and career advancement, it has been possible to guide the transition processes and simultaneously create future prospects.

Like these villagers on a public transport boat in Madagascar, science is on the move: global programmes such as Future Earth offer opportunities for CDE to strengthen its profile. Photo: Julie Zähringer, CDE

Highlights in the rear-view mirror

While 2014 was a year of new beginnings, it was also marked by the closure of several major programmes. This included the Swiss National Centre of Competence in Research (NCCR) North-South, our most significant research programme of the last 12 years, as well as important application-oriented programmes such as the Eastern and Southern Africa Partnership Programme (ESAPP) in collaboration with the Swiss Agency for Development and Cooperation (SDC). CDE's guiding strategy proved to be very helpful in this period of transition. In our pursuit of new research grants, we oriented ourselves according to our consistent mission of producing knowledge for sustainable development together with partners in the global North and South, and in line with our clear focus on renewable natural resources, socio-economic disparities, and land governance. It is with a sense of pride that we reflect on our successful acquisition of funding for four long-term research projects through the competitive calls for bids of the Swiss Programme for Research on Global Issues for Development (commonly known as r4d) and the Belmont Forum. Not only does this ensure the continuity of our research across all our thematic clusters for the next few years, it demonstrates the ability of CDE and its partners to succeed in a very competitive research environment after the conclusion of the NCCR North-South programme.

Construction of the Three Gorges hydropower plant in this Chinese valley has pushed small farmers to the margins. Photo: Hanspeter Liniger, CDE

> “The new international development agenda provides a major opportunity for science to supply knowledge for transformation”

With the acquisition of these research projects, the share of our university funding will fall below the 20 per cent mark. While we are pleased to report a multiplier effect of four for the funds entrusted to us by the Rectorate, we will have to keep a careful eye on these figures going forward. We must maintain a sensible balance between research projects and service provision. Given the diverse achievements of our application-oriented projects, the positive response to our public relations efforts, and the impacts of our policy work – for example, through our new series of policy briefs – we are optimistic that our work will remain relevant and will continue to be in demand in Switzerland and internationally.

Reflections on what lies ahead

We are very pleased with the way in which events in 2014 enabled us to consolidate our work in many different areas. There are several important changes on the horizon that promise to affect us, whether directly or indirectly. At the international level, a new international development agenda is currently being negotiated that will influence the national strategies of many countries and donors. At the same time, it presents a major opportunity for science to act as a partner in the negotiation process, supplying knowledge for decision-making and learning. For the research community, this is an invitation to establish linkages between disciplines and with actors outside scientific circles, bringing together groups that normally operate independently of one another. At CDE, we believe we are exceptionally well-positioned in this respect, since we bring to the table knowledge, methods, concepts, as well as strong research partnerships with partners in the global South and North. We aim to better harness what we offer through increased engagement in the international research programme Future Earth and through closer collaboration with our development partners. The renewal of our strategy – which we will undertake this year for the period from 2016 to 2021 – provides us with an opportunity to further sharpen our profile in this direction. We look forward to pursuing this process together with our members, the CDE Board, our research partners from five key regions, and many other network partners. We are confident that with an updated strategic orientation and targeted activities our ability to provide knowledge for sustainable development worldwide will only grow stronger.

Programme work

Programme overview

Together with partners in Europe, Africa, Asia, and Latin America, CDE conducts research to develop innovative concepts and solutions for the sustainable use of land and water resources. Photo: Lilian Trechsel, CDE

CDE and its members maintain a worldwide network of national and international research partnerships. Our cooperation with long-standing partners enables CDE researchers to better understand the impacts of global change and to develop appropriate solutions locally, regionally, and globally. Research partnerships drive innovation, make research more relevant for policymaking and development, and raise public awareness of how science contributes to sustainable development in the global North and South.

In 2014, our experts were particularly active in the Horn of Africa, East Africa, and Southeast Asia, in terms of both the number of projects and their respective budgets. Besides scientific programmes and projects, these figures reflect several long-term application-oriented mandates funded by the Swiss Agency for Development and Cooperation, for example to establish so-called Water and Land Resource Centres in Kenya and Ethiopia, or to develop an information hub to support political decision-making in Laos.

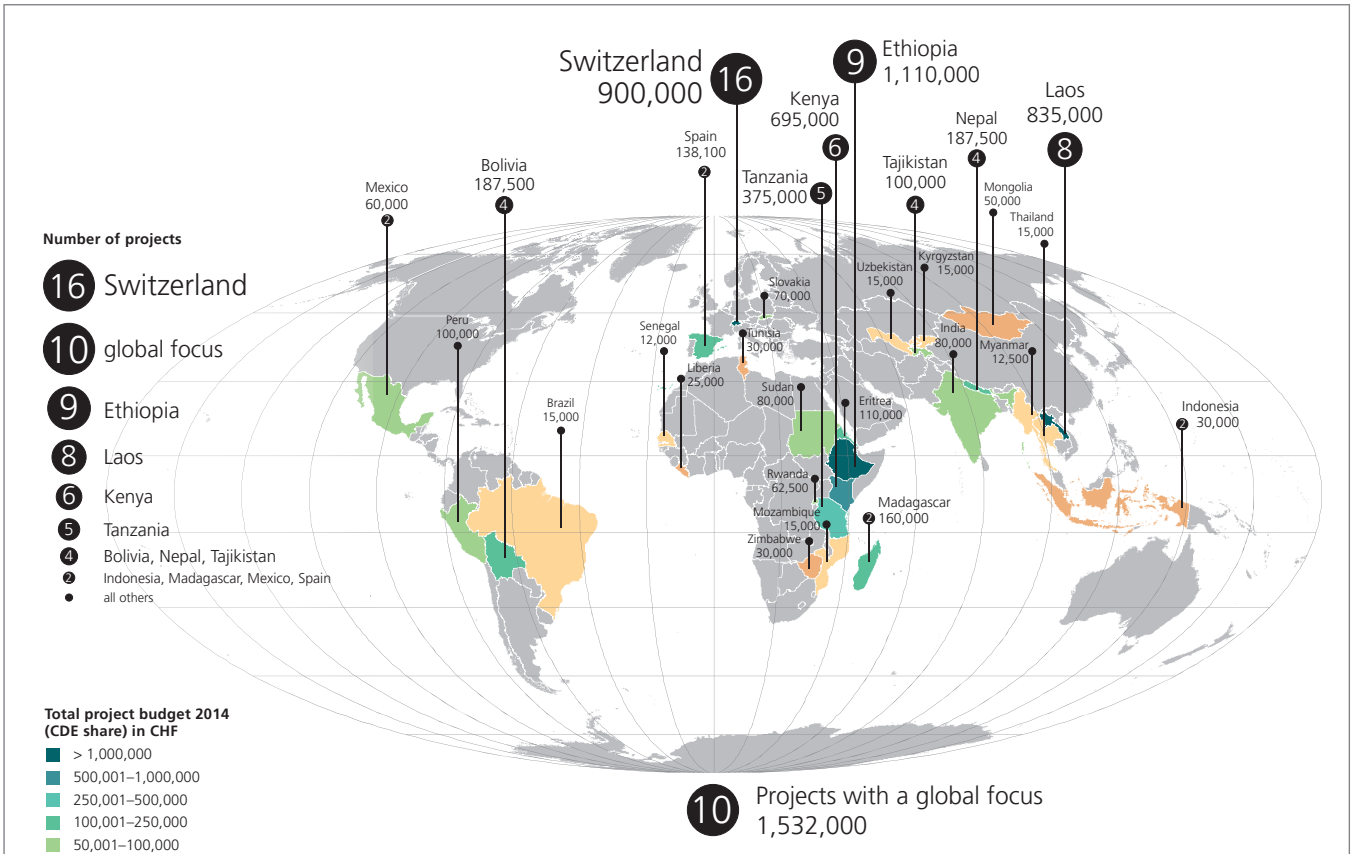
Our portfolio also comprises global networks that CDE has been building and strengthening together with international partners over many years. Examples include the World Overview of Conservation Approaches and Technologies (WOCAT) network, which promotes sustainable land management practices around the world, and the Land Matrix, a global initiative to increase transparency in transnational land deals.

In Switzerland, CDE's research focuses on analysis of sustainability concepts and studies on the implementation of sustainable development. This includes research on how sufficient lifestyles can advance sustainable development, for example, or research on the promotion of electric vehicles in Switzerland.

CDE's key partner regions

In 2014, CDE ran activities with a regional or national focus in 31 countries worldwide. Key regions are Eastern and Southern Africa, the Horn of Africa, mainland Southeast Asia, especially Lao PDR, the central Andes, and Central Asia. Many of these projects and programmes represent a long-term engagement. For example, CDE's researchers have been active in Eastern Africa and the Horn of Africa for over 35 years, and in Central Asia and Southeast Asia for over 20 years. Such long-term engagement would not have been possible without trusted partnerships including both regional partners who have the capacity to implement activities as well as partners and agencies in Switzerland and abroad who are willing to fund programmes that adopt a longer-term perspective.

Researchers from Nepal and Switzerland are mapping land degradation and conservation in Kaski District, Nepal. Photo: Gudrun Schwilch, CDE



Overview of projects and their size in 2014. See also table on pp. 50–52. Cartography: Anneka Weber, CDE

Programme highlights

A Web application developed by the Institute of Medical Education helps to save millions of sheets of paper annually. Photo: Sandra Flückiger, University of Bern

Inaugural Sustainable University Day at the University of Bern

How do Swiss universities incorporate sustainability in their teaching, research, and operations – for the benefit of society? What can we expect from universities in the future? The first Sustainable University Day at the University of Bern illuminated these questions from different perspectives. In a morning session, researchers and students from various Swiss universities discussed sustainability concepts and integration of sustainability in academic curricula.

As host, the University of Bern got to spotlight its own activities in the afternoon. It held an interactive research fair, presenting selected projects concerned with sustainable development. Topics ranged from the use of historical research on natural disasters in planning sustainable urban development, to the role of Christian churches in sustainable development, or the question of whether our current economic model contradicts sustainability.

A panel discussion with Bernhard Pulver, member of the government of the Canton of Bern, highlighted the need to strategically anchor sustainability, and addressed related political expectations. "Sustainable development involves every area of science. Promoting sustainability requires linking one's research to society at large," said Bernhard Pulver. From the perspective of academia, virtually everyone agreed that the biggest challenge lies in getting professors on board. Sustainable development requires interdisciplinarity, which tends to be inadequately rewarded in academia. The event was part of the Sustainable Development at Universities Programme 2013–2016, and was jointly organized by CDE, the University of Bern, and the Network for Transdisciplinary Research of the Swiss Academies of Arts and Sciences.

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Foreign companies investing in Kenya produce luxury goods such as long-stemmed roses, destined for wealthy industrialized countries. Photo: Lilian Trechsel, CDE

Five new long-term research projects for CDE

In 2014, CDE successfully acquired funding from different sources for five long-term research projects set to start in 2015.

Three of the new projects are funded by the Swiss Programme for Research on Global Issues for Development, commonly referred to as the r4d Programme. CDE is the leading house of two of these new r4d projects, namely Food Sustainability and Telecoupled Landscapes, which it will carry out together with various partners in Switzerland and in developing countries. Food Sustainability aims at finding ways of making food systems more sustainable. Telecoupled Landscapes examines the growing phenomenon of decisions on land use being taken by actors in distant places. CDE is junior partner of a third r4d project, Invasive Species, which investigates the mitigation of invasive woody plants in Eastern Africa. All three projects are scheduled to last six years.

In the EU Framework Programme for Research and Innovation, Horizon 2020, CDE is participating in a five-year project named Interactive Soil Quality Assessment (iSQAPER), together with 25 other partners

from the EU and China. The goal of this project is to develop a mobile software application for use in understanding and evaluating soil quality and validating agricultural soil management practices.

CDE is also participating in the global research platform known as Future Earth: Research for Global Sustainability. In the three-year AFGROLAND project, CDE and partners from South Africa and France are analysing changes to agro–food–energy systems and their influence on agricultural investments in countries in the global South, especially in Africa. The project is part of the Belmont Forum and the Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI). The Belmont Forum is a group of high-level representatives from major funding agencies supporting global change research, and the FACCE-JPI comprises 21 countries that aim to build an integrated European Research Area addressing the topics in its title.

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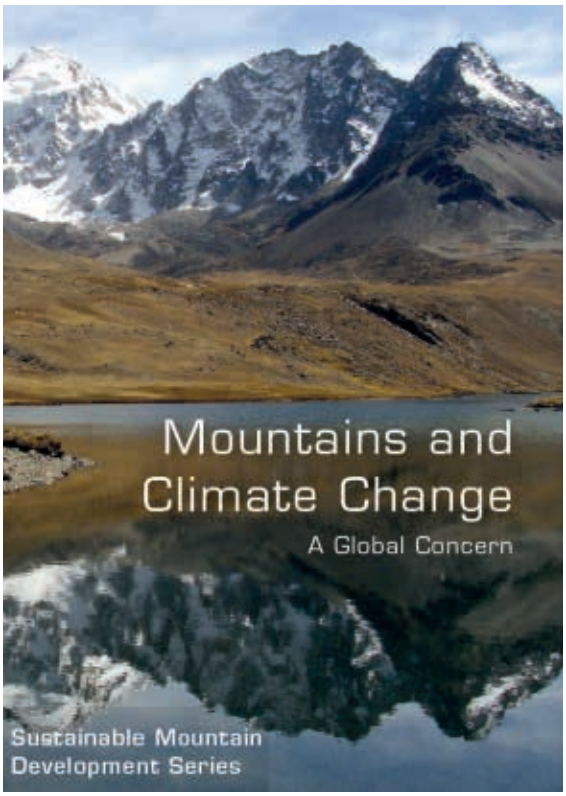
Climate change impacts on mountains concern us all



This new publication by CDE and partners demonstrates that climate change impacts on mountains will reverberate far beyond mountain areas. The cover shows Mount Illimani, above La Paz, Bolivia. Photo: C. Devenish

Mountains are the world's water towers: mountain regions provide freshwater to half of humankind. This water is critically needed for domestic use, lowland irrigation, and hydropower production. Further, mountains are centres of biological diversity, key sources of raw materials, and important tourist destinations. As providers of crucial ecosystem goods and services, mountains are essential for global sustainable development. At the same time, mountains are highly sensitive to the forces of global change, and climate change in particular. Accordingly, impacts of climate change on mountain areas reverberate far beyond these areas, as shown in a publication prepared by CDE and partners for COP 20, the United Nations climate change conference held in Lima in December 2014. Titled *Mountains and Climate Change: A Global Concern*, the publication addresses issues such as water supplies, glacier retreat, permafrost thaw, natural hazards, biodiversity, food security, and economic prospects. Twenty-five authors from around the world contributed case studies that show how concrete adaptive action has been taken in mountain areas across the globe. The publication concludes with a series of recommendations for sustainable mountain development in the face of climate change. Considering their vital role in providing key goods and services to humankind, mountains must be included in the climate change debate as well as in the post-2015 development agenda and Sustainable Development Goals. The publication was compiled by CDE in collaboration with the Swiss Agency for Development and Cooperation (SDC) and the United Nations Environment Programme (UNEP), with funding from SDC and the Austrian Development Agency (ADA).

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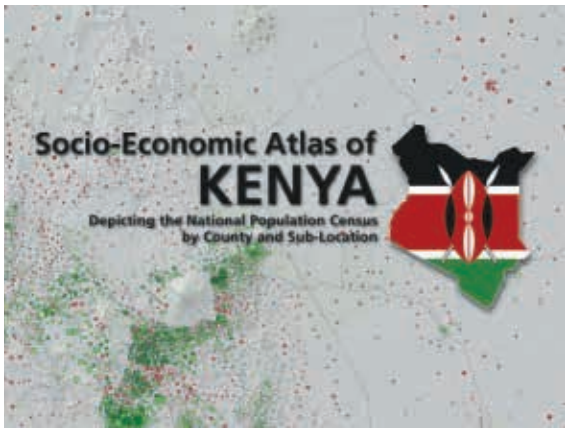
A groundbreaking atlas for Kenya



CDE and its partners have launched the first-ever socio-economic atlas of Kenya featuring high-resolution data. Photo: CDE

Together with its partners in Kenya, CDE released the first-ever socio-economic atlas of Kenya. The atlas features high-resolution spatial depictions and analyses of data collected in the 2009 Kenya Population and Housing Census. The combination of geographic and socio-economic data enables policymakers at all levels, development experts, and other interested readers to gain a spatial understanding of dynamics affecting Kenya.

Where is the informal economic sector most prominent? Which areas have adequate water and sanitation? Where is population growth being slowed effectively? How do education levels vary throughout the country? And where are poverty rates lowest? Answers to questions such as these, grouped into seven broad themes, are visually illustrated on high-resolution maps. By supplying precise information at the sub-location level and summarizing it at the county level, the atlas facilitates better planning that accounts for local contexts and needs.

It is a valuable decision-support tool for government institutions at different administrative levels, educational institutions, and others. Three organizations – two in Kenya and one in Switzerland – worked together to create the atlas: the Kenya National Bureau of Statistics (KNBS), the Nanyuki-based Centre for Training and Integrated Research in ASAL Development (CETRAD), and CDE. Close cooperation between KNBS, CETRAD, and CDE maximized synergies and knowledge exchange.

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Not too little and not too much: "sufficiency" is key to sustainable development

How much stuff does a person need for a good life? Shopping at a supermarket. Photo: 1000 Words/shutterstock.com

Global use of natural resources is growing year by year despite innovations for greater efficiency. It is clear that more efficient technologies alone will not solve the world's climate and resource problems. A CDE research team views "sufficiency" as a crucial approach to complement strategies of efficiency. Taking a sufficiency approach means actively reducing our demand for and use of resources, especially non-renewable natural resources, by adopting a non-consumerist concept of well-being, quality of life, and what makes a good life. Ultimately, the approach aims at balancing resource use at a level where we use just enough – not too little, and not too much.

CDE's project, funded by Stiftung Mercator, seeks to identify how people in Switzerland who lead a sufficient lifestyle shape their daily consumption and mobility patterns, and how this lifestyle contributes to a good life. How do they act, and what motivates them to do so? How do they perceive their quality of life? According to initial results, respondents perceive different ways in which a sufficient lifestyle contributes to a good life. They frequently mention that it frees up time for leisure activities, as their reduced material needs enable them to spend less time working for a living. When it comes to finding ways of anchoring sufficient lifestyles in society, respondents see opportunities above all in education and childcare. The overarching goal of the project is to demonstrate ways of promoting sufficient lifestyles and embedding them in society.

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> “I have always wanted to make sure that my doctoral research would bring significant positive outcomes to my country. Now I can certainly find and plan ways to realize that, as I have learned how I can involve non-academic actors throughout the phases of my research.”
>
> (Anonymous feedback from 2014 summer school participant)

The IGS North-South students expressed appreciation of the summer school’s methodological focus and the exchange with scientific and non-academic actors. Photo: Lilian Trechsel, CDE

IGS North-South Summer School on “Resources, Economy, and Governance”

CDE jointly conducted the 2014 International Graduate School (IGS) North-South Summer School on “Resources, Economy, and Governance” together with its partner in Kenya, the Centre for Training and Integrated Research in ASAL Development (CETRAD). Local resource persons from the University of Nairobi, the Kenya Methodist University, Moi University, and the University of Eldoret were invited by CETRAD, further expanding our network of partners. Twenty-eight students representing 14 countries and numerous disciplines attended the summer school, where they learned to apply the sort of inter- and transdisciplinary approach that is required by research for sustainable development in North–South partnerships. In the course of various field visits, students discussed water management issues with members of water resource users’ associations in a semi-arid area where pastoralists, small-scale farmers, and large-scale horticultural enterprises compete for land and water resources. This exercise aimed at illustrating and improving participants’ understanding of the first stage of a transdisciplinary research project, namely development of research questions in collaboration with non-academic stakeholders. Among other lessons learned, the summer school confirmed the importance of offering conceptually and methodologically focused training to PhD candidates from the South.

The IGS North-South is a joint initiative of the universities of Bern, Basel, and Zurich. It was established in 2009 within the framework of the Swiss National Centre of Competence in Research (NCCR) North-South. CDE coordinates the IGS North-South’s annual summer school.

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Smallholder farmers in Kenya. Photo: Hanspeter Liniger, CDE

> “Worldwide knowledge exchange among stakeholders and researchers promotes innovative land management”

Spotlight on the role of soils in sustainable development

The importance of keeping soils healthy

Our lives depend on healthy and productive soils. In the last half-century, population growth has caused the area of available arable land per person to decrease from 0.45 to 0.22 hectares. Modern farming – characterized by intensive use of technology, fertilizer, and energy – has greatly increased food yields in many regions. But inadequate farming practices, soil overuse, and environmental factors are increasingly leading to soil degradation and, in dry areas, to desertification. In the face of climate change, it is all the more important that producers adapt to increasingly difficult conditions by switching to energy-efficient, "climate-smart" production methods rather than further stepping up their use of inputs and energy. Highlighting the global importance of the issue, the United Nations designated 2015 the International Year of Soils.

CDE research contributes to maintaining soils and land as an important basis for stable natural ecosystems, farming, and food security. Examples provided in this annual report illustrate the challenge of sustainable land use for both global South and North. They also show that exchange of knowledge between local actors and researchers around the world promotes innovative methods for sustainable land management and contributes to human well-being.

One-quarter of agricultural soils worldwide are severely degraded and to some degree constrained in their capacity to produce food or perform other essential ecosystem services. This gully in Ethiopia provides a vivid example. CDE researchers work with local populations to find sustainable solutions for keeping soils healthy. Photo: Hanspeter Liniger, CDE

Detecting soil degradation

Research in some of the poorest countries in the world, such as Ethiopia, shows the immense importance of soils for the well-being of rural populations. Up to two-thirds of all agricultural land worldwide is estimated to be "degraded" in some way, meaning that it is constrained in its capacity to produce food or perform other essential ecosystem services. Despite years of research, the full extent of land degradation remains unknown in most countries, as different types of soils and degradation in different ecosystems are hard to compare or even identify in terms of scale. CDE research has helped to close knowledge gaps and develop methods that enable more differentiated assessments of various dynamics. For example, erosion mapping and water balance modelling in Switzerland and Ethiopia have made it possible to identify specific cultivation methods that cause or reduce degradation.

Soils are often overused amid efforts to feed the growing world population. In search of effective soil protection methods, CDE documents and researches sustainable land management practices and assesses their ecosystem services. Farm in the Canton of Fribourg, Switzerland. Photo: Gudrun Schwilch, CDE

Collecting best practices of sustainable land management

There are many good land use practices that can curb degradation and improve soil quality. CDE and its partners have long focused on identifying and systematically documenting land users' recipes for success. In 2014, the World Overview of Conservation Approaches and Technologies (WOCAT), an international network whose Secretariat is housed by CDE, was officially recognized by the United Nations Convention to Combat Desertification (UNCCD) as the primary recommended database for documenting sustainable land management best practices. An impressive 97 per cent of land use practices documented by WOCAT show a positive or very positive long-term cost–benefit ratio. While land users may profit directly from improved livelihoods, healthier soils also have many important benefits for society at large.

Valuation of ecosystem services

Soils perform multiple ecosystem services that benefit humankind directly: they produce food, conserve water and nutrients, and constitute an important record of our natural and cultural history. Assessing ecosystem services scientifically and evaluating them with various stakeholders makes it possible to compare different soil management practices and make informed decisions on behalf of sustainable development. Practical approaches to this type of assessment are currently being developed in a European research project on sustainable soil management – RECARE – and tested in Switzerland.

> “Up to two-thirds of all agricultural land worldwide is estimated to be degraded to some degree”

The impacts of climate change strongly affect Central Asia. Disasters such as floods, landslides, and debris flows are becoming more frequent. Photo: Yvo Weidmann

Large-scale land acquisitions intensify competition for resources

In their efforts to acquire large tracts of land abroad, international investors often target developing countries with weak legal systems. The global Land Matrix initiative – of which CDE is a major partner – contains data about more than 1,000 land deals that illustrate the scale and significance of these investments. CDE has analysed the impact of these land deals and found that international land investments often increase competition for scarce land resources. This, in turn, can promote poverty and conflict. CDE’s goal is to improve the transparency of international land deals through research, and to provide policymakers with evidence on which to base new regulatory measures.

Overuse, climate change, progressive degradation, and increasingly competitive, globalized claims for land use are endangering the soils upon which our lives depend. CDE seeks to identify current trends, to explore effects and interconnections, and, together with diverse actors, to promote promising results for sustainable soil and land use.

Hans Hurni on soil quality, agriculture, and food security in Ethiopia

Interview by Corina Lardelli

Hans Hurni, Member of the CDE Board
Photo: Barbara Willi, CDE

> “Can healthy soils end hunger?”

Hans Hurni is Professor of Geography and Sustainable Development at the University of Bern, and was CDE’s founding president (2009–2013). He was one of the lead authors of the International Assessment of Agricultural Knowledge, Science and Technology for Development (2005–2008). From 1974 until 1987 he lived with his family in Ethiopia, first as Director of the Simen Mountains National Park, and then as initiator and leader of the nationwide research network combatting soil erosion, known as the Soil Conservation Research Programme. He experienced first-hand the start of one of the greatest famines of the 20th century: how it was perceived by the authorities, how it was communicated and, initially, internationally ignored, until it was too late for tens of thousands of farming families in rural Ethiopia.

Hans Hurni, you are currently in Ethiopia conducting fieldwork, staying in remote rural areas. Can you give us a few impressions?

I have worked in Ethiopia for the past 41 years, and I always make a point of visiting areas on foot that are off the road and difficult to reach. On these hikes, my first impression is always that nothing has changed in all these years: I see farmers ploughing the steep slopes of their land with two oxen and a scratch plough with an iron tip, just as they may have done for the past 2,000 to 3,000 years. But these first impressions are misleading. The number of houses in Ethiopia has more than doubled in the last 40 years, many rural roads have been built, nearly all villages have schools and some have clinics, and many eucalyptus trees have been planted to ensure supplies of timber and firewood. At the same time, land degradation remains severe and measures to combat it are still inadequate. Even though hundreds of millions of trees have been planted and about 20 million hectares of agricultural land have been terraced, no measures have yet been taken on some 60 per cent of agricultural land.

Ethiopia is one of the poorest countries in the world. Almost half of the population is undernourished and, even in good harvest years, millions of Ethiopians remain dependent on food aid. Why does the hunger continue?

It would be wrong to assume that healthy soils alone can stop hunger. The causes of undernourishment in Ethiopia are diverse: for one, families’ farming plots have shrunk due to population growth. And yields per hectare have decreased due to soil erosion. About 80 per cent of the population live off agriculture: that is more than 70 million people. The secondary and tertiary sectors are developing rapidly, and since the turn of the millennium the gross domestic product (GDP) has grown by about 10 per cent annually. But because Ethiopia’s GDP remains one of the lowest in the world, visible changes are slow. If farmers had enough support – for example through expanded funding for extension services and sustainable land management, improved market access, and rural infrastructure – their current low

Soil and water conservation in Rike, Wello, Ethiopia, introduced in the 1980s as part of the state campaign. Photo: Hans Hurni, CDE

annual yields of 0.5 to 2 tonnes per hectare could be doubled relatively quickly, and food shortages could be tackled effectively. But that is only possible on healthy farming land.

In the 1980s and 90s, you were head of a national research programme to control soil erosion in Ethiopia. How do you see the programme's achievements today?

Those of us from the University of Bern who knew Ethiopia were enthusiastic from the start when we saw how Ethiopian authorities, working together with the international community, countered land degradation by organizing people to build terraces and plant trees. But Ethiopian farmers in the beginning did not share our enthusiasm – there were criticisms that the authorities were not sufficiently taking into account social and economic conditions. Our research network comprised an interdisciplinary team of engineers, agronomists, geographers, sociologists, and economists, all of whom were able to learn from one another. But the most important source of knowledge proved to be the farmers themselves. Based on their knowledge, and with their participation, we continuously adapted our research programme, and today there are hardly any farmers who consider soil conservation unimportant: on the contrary, we can scarcely keep up with demand from the rural population, aid organizations, and the Ethiopian government. So in 2011, with the help of the Swiss Agency for Development and Cooperation, we set up the Water and Land Resource Centre (WLRC), which is supported by Addis Ababa University and CDE, and led by Dr Gete Zeleke, a former PhD student of mine.

What is the biggest agricultural challenge faced by Ethiopia's rural population?

Agriculture must become more sustainable, with greater investments in healthy soils and development of rural infrastructure, markets, and road access to villages. Measures to achieve this are underway, but the large extent of Ethiopia's agricultural area is a

Discussing world heritage issues with Ethiopian colleagues in Simen Mountains National Park, Ethiopia. Photo: Sarah-Lan Mathez-Stiefel, CDE

major challenge for all involved. It will take decades to improve the state of the 600-million-hectare agricultural area, of which 200 million hectares are rain-fed croplands farmed by more than 15 million households. Children make up about half of Ethiopia's population. They almost all go to school nowadays, but often only for a few years – and those who can complete school will likely stop working in the fields. Things were similar in Switzerland about 150 years ago, and now less than three per cent of the Swiss population works in agriculture. Ethiopia will also have to move in this direction, albeit perhaps less drastically.

The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD, 2005–2008) calls for the strengthening of small-scale farmers and an increase in organic farming, to reduce undernourishment and poverty. What is demanded of science?

Global development today is driven by "knowledge societies", and the poorest countries should not be excluded from this. These countries must be able to benefit from globally available knowledge, which must, however, be adapted to suit local conditions. In this regard, there are still many gaps to be filled: economic and political North–South disparities, the digital divide, access to knowledge and information, and, finally, the opportunity to generate knowledge, that is, to carry out research. This is where the contribution of development cooperation has been inadequate so far: research was considered the privilege of elites and of little use to the poor. But without science and autonomous knowledge generation, these countries will not be able to break out of their situation.

Within the Swiss National Centre of Competence in Research (NCCR) North-South programme, you trained many Ethiopian doctoral students who now work for sustainable development in their home country. What advice would you give these researchers?

In my long research career I have learned to stop giving advice. I encourage our partners in the South to use their skills for the benefit of their countries – in research facilities, educational institutions, development projects, or international organizations. It is nice to experience how our Ethiopian colleagues always reflect on the times we spent in projects together with a sense of enthusiasm and nostalgia. Today, they report back to us on what they have been able to do with the knowledge they acquired, even if their careers – as for many of us – haven't always followed a linear path.

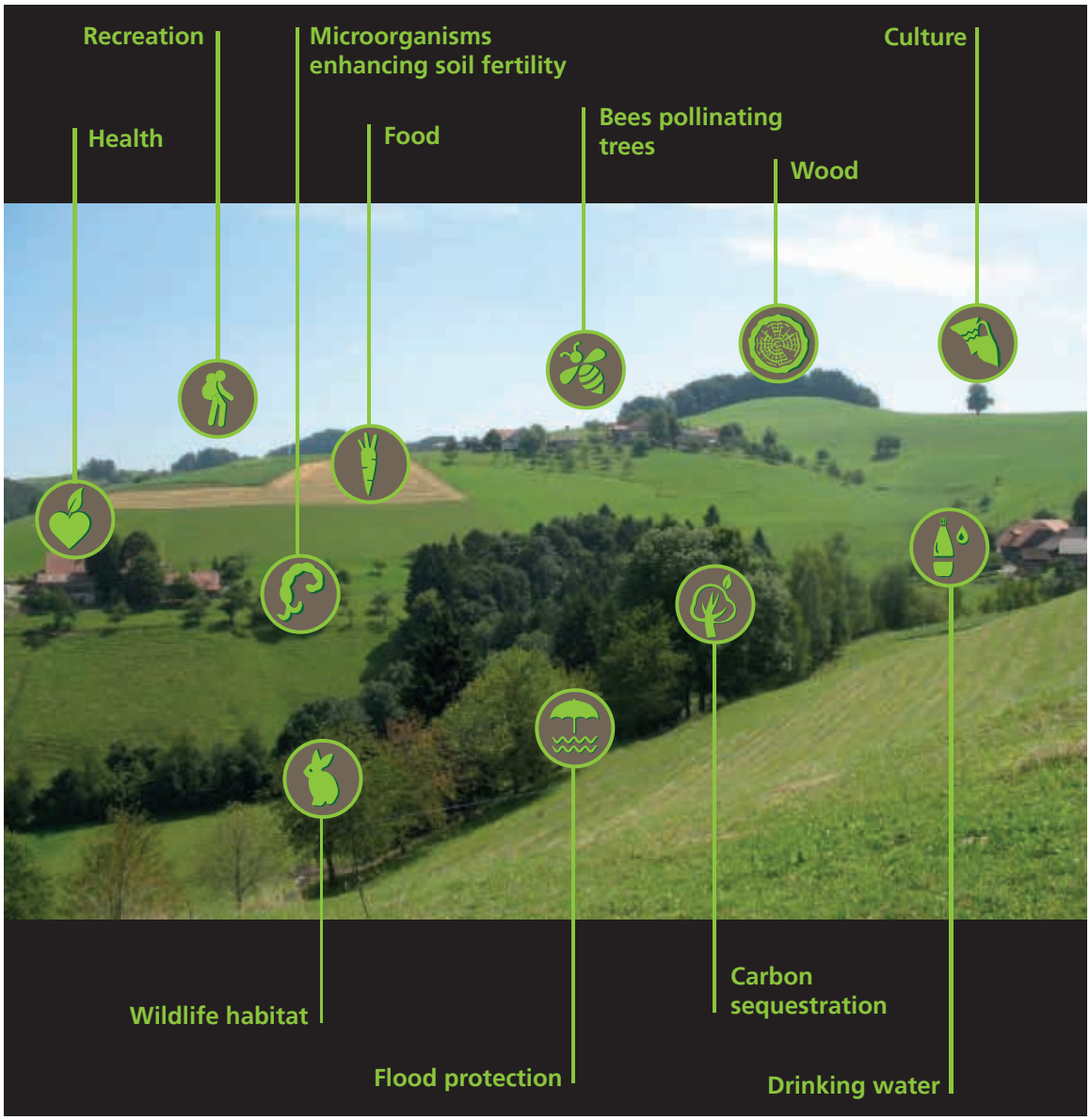
Assessing ecosystem services: What do our soils contribute?

Without the ecosystem services provided by soils, there would be no production of food or fodder, wood or biofuels. We would not have clean drinking water or adequate protection from floods or high water. Soil protection therefore has enormous significance for our social and economic development and its sustainability. Efforts to use land sustainably and preserve its ecosystem services can only succeed if they take account of the various stakeholders' diverse needs. In Frienisberg, Switzerland, just north of Bern, CDE is collaborating with local stakeholders and an international research team to develop a universally applicable methodology for the assessment of sustainable land use based on soil functions and ecosystem services.

Soils perform multiple ecosystem services: they produce food, conserve water and nutrients, and constitute an important record of our natural and cultural history – for example in this agroforestry system in Central Asia. Photo: Bettina Wolfgramm, CDE

Soil erosion affects us all

In agriculture, the interests of soil protection and farm production often appear diametrically opposed. Our globalized markets essentially force farmers to produce as much as possible as cheaply as possible. But this risks harming the very soils upon which production directly depends. It is a case of killing the goose that lays the golden eggs – except that the harm to soil productivity is often masked for a fairly long time by heavy use of fertilizer and chemicals (herbicides, pesticides, etc.). On the Swiss plateau, soil erosion leads to the loss of 0.7 to 2.3 tonnes of productive earth per hectare annually. This is relatively minimal compared with the European average. In isolated cases, however, losses can reach as high as 70 tonnes per hectare. Less visible losses include soil fertility declines, compaction of subsoils, and diminished water holding capacity. So-called offsite damages such as sediment build-up in drainage systems, pollution of waterways, and siltation of roads all produce costs that are borne by the general public. So soil degradation is not merely a problem for farmers, but rather affects everybody and must be addressed collaboratively with all stakeholders. Similar dynamics around this issue may be found in virtually all countries, whether in the global North or South.



Soil ecosystem services are fundamental to life. The diagram shows the diversity of soil ecosystem services in a cultural landscape in the Canton of Bern, Switzerland. Photo: Gudrun Schwilch, CDE

Developing methods to assess ecosystem services

Within the European research project RECARE, CDE is analysing solutions for sustainable soil management and ways of assessing ecosystem services in the region of Frienisberg. The researchers are developing a methodology that makes it possible to identify, measure (as feasible), and appraise soil ecosystem services together with all stakeholders. Rather than providing a purely economic valuation of these services, the methodology is intended to generate a broader valuation where values are jointly determined and negotiated in a learning process among stakeholders and include social and ecological criteria as well. This will ultimately enable participants to compare the pros and cons of different soil protection measures and to make evidence-informed decisions. The methodology has to be easy to apply and useful for practical purposes, while taking account of available scientific knowledge to the furthest possible extent. Once the methodology is finalized, local researchers will implement it in all 17 case study regions of the RECARE project.

Side-by-side comparison: the left-hand field is being farmed using a traditional plough. Its plant cover is about ten per cent, and the soil is visibly muddy. The right-hand field is being farmed using no-till methods. Its plant cover is about 40 to 50 per cent, including the layer of straw. Its soil is better able to absorb and retain water. The fields are located in the Canton of Bern, Switzerland. Photo: Christine Hauert

Water drainage depends on the structure of soils

Valuation of soil ecosystem services requires a comprehensive understanding of complex soil processes. Analyses by CDE researchers have shown that soil structure plays a key role in the drainage and storage of water. If use of heavy farming machinery compacts the soil, for example, this can harm its hydrological properties and increase flood risks. One possible solution to prevent compaction and erosion is no-till farming, in which traditional ploughing is avoided and seeds are planted directly into the soil using special machinery. Residues from the previous crop remain on the ground as mulch. In Switzerland, coverage of this relatively new cultivation technique has expanded from a few hectares in the 1980s to several thousand today. Measured against Switzerland's total arable land, however, it still covers only about three per cent of farmland. No-till has many proven advantages: erosion is visibly reduced and the diminished use of tractors lessens labour inputs and carbon dioxide emissions. Moreover, it has been proven that no-till increases organic soil content from two to three per cent within few years, although to date this has not been shown to significantly raise crop yields. So many farmers hesitate to switch to no-till. In addition, no-till requires usage of herbicides, which can give fields a scorched, untended appearance and may contradict efforts to reduce chemicals in farming. Despite these drawbacks, no-till's proven improvement of soil structure and loosening or breaking up of compaction are important to the long-term health of soils. Projects like RECARE are crucial to identify these relationships and improve our understanding of them – especially because they facilitate direct exchange between land users and scientists and bring together their perspectives and knowledge while enabling mutual learning. This ultimately leads to more sustainable land use and improved livelihoods for all.

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Care for land, reduce desertification

The degradation of landscapes often takes the form of abrupt, irreversible changes that are difficult to predict. The EU-funded CASCADE project focuses on such instances of so-called regime shift throughout various ecosystems of Mediterranean Europe (Portugal, Spain, Italy, Greece, Cyprus). In some of these regions, the outmigration of rural communities plays a crucial role. Resulting neglect of land management often produces a negative spiral of events with catastrophic consequences for soils and the remaining population. In other regions, overgrazing is damaging the vegetation cover, causing soils to dry out and erode. Together with their partners in Spain, Greece, and Cyprus, CDE researchers are analysing the causes of land degradation and helping to identify appropriate land use practices that minimize the risk of irreversible changes and maximize the resilience of ecosystems.

The hill in the foreground has been affected by fire. Its vegetation is recovering poorly, especially along the southwest-facing slopes. Photo: Hanspeter Liniger, CDE

When fires parch the landscape

The environment of Ayora, Spain, is littered with dry bushes, shrubs, and densely packed pine forests. Since the 1970s, at least four massive fires and numerous smaller ones have occurred in the region – often with devastating consequences. The southwest-facing slopes are threatening to dry out and desertify. The northeast-facing slopes are increasingly overgrown with mainly dry bushes, further heightening the risk of fires. How did it get to this point? Why doesn't the vegetation in these places recover on its own? And what can residents of Ayora do to stop the advancing desertification?

Centuries ago, the hills of Ayora were covered with forests. The forests, mostly composed of holm oak trees (Quercus ilex), would recover relatively quickly from fires. Over time, they were cut down to make room for agricultural uses. But today, after decades of rural exodus, the land is only marginally farmed, and fire-prone bushes have expanded. Remaining residents have planted dense pine forests on some of the abandoned areas, but they too carry a high risk of fire. In an effort to curb the spread of forest fires, the community has now installed a network of firebreaks. These vegetation-free stretches of land, mainly

The roots of carob trees help to protect the soil against erosion. Photo: Matteo Jucker, CDE

running alongside roads, provide better access for fire-fighting vehicles and reduce the speed of fires. Silvicultural measures (for example gradual thinning of tree growth) also slow the spread of fires, if they occur. But while these measures are certainly helpful, they do not prevent fires from breaking out. In addition, they are only applied in forest areas, but not in the bush areas, where the risk of fire is just as high. Restoring the original, more resilient Quercus ilex forests in the area would be costly and demanding, since afforestation of these trees is difficult under the current conditions. Analysis by CDE researchers has shown that forest fires and bush fires have had particularly devastating consequences along south- to west-facing slopes. Vegetation here has scarcely recovered, resulting in soil degradation and irreversible processes of desertification. The situation clearly illustrates how neglect of land in semi-arid regions like Ayora can cause lasting damage to soils.

When rats eat trees

Degradation processes have also become visible in the municipality of Pissouri, Cyprus. It is located in the dryland region of the Mediterranean, which is vegetated mostly with dry bushes and shrubs. Low rainfall is the main factor limiting plant growth, and the carob tree is the only tree species well-adapted to local conditions. In dry periods, the tree provides shade and a source of feed for grazing animals. In rainy periods, it stabilizes the ground with its network of roots and prevents erosion. Its fruit contains a vitamin-rich honey. This tree is essential to protect soils and the ecosystem in Pissouri. But now it is threatening to disappear, since land management has also been neglected in Pissouri owing to rural exodus. Areas previously under cultivation are beginning to grow over with bushes, providing a favourable environment for expansion of the local rat population. The rats drink sap from the carob trees' branches, causing the trees to

The effects of overgrazing (left) and of managed grazing (right). Barley planted on once-idle fields covers half the daily feed requirements of farmers' sheep. This protects the remaining vegetation from overgrazing. Photo: Matteo Jucker, CDE

die. Many of the carob trees in Pissouri have disappeared on account of the rats. Local farmers are now trying to protect the trees and have installed traps to fight the rat invasion. They hope to maintain the current stock of trees, since it is so crucial to protect the soil against degradation. The researchers' analyses emphasize just how hard it would be to replant carob trees on a degraded landscape. Without the protective root systems afforded by the remaining trees, any new seedlings would be washed away during the rainy season.

Cultivating barley to maintain the land and prevent overgrazing

Some of the farmers in Pissouri have begun cultivating drought-resistant barley on previously idle patches of land. Two harvests a year cover half the feed requirements of their livestock (sheep and goats). This reduces the grazing pressure on trees and bushes in the area. The resumption of cultivation also means the land is managed better and is more resilient to external influences. Bush fires, for example, don't spread as quickly in cultivated areas as they do in idle shrublands. Overall, the case illustrates how appropriate land use practices can set in motion various positive processes. The goal of the CASCADE researchers is to gather these sorts of positive examples from semi-arid areas in the Mediterranean, to assess them, and to share the resulting knowledge with the local populations.

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Land deals intensify competition for scarce resources

What types of land do foreign investors covet? Do their investments support sustainable agricultural development? CDE researchers analysed large-scale land acquisitions in the global South, seeking to identify the socioecological characteristics of land targeted by investors. The evidence indicates that foreign investments are intensifying competition for the "best" land – that is, the most accessible, fertile land – even if land users already occupy it. Ensuring that such investments instead contribute to sustainable, inclusive use of land requires strong public guidance and oversight.

Farmer transporting latex on a large rubber plantation in Vietnam. CDE and its partners are analysing large land deals and providing transparency by means of an interactive website, www.landmatrix.org. Photo: Tonkin image/shutterstock.com

Countries targeted are among the world's least developed

Since the worldwide food price crisis of 2008, foreign investors have rushed to acquire large amounts of agricultural land in poorer countries. The Land Matrix, a global database of international land acquisitions, currently has data on over 1,000 land deals concluded between 2000 and 2014, covering over 37 million hectares in 77 countries. The database shows that many of the countries targeted for investment are among the world's least developed. Top target countries in terms of area covered by deals include Papua New Guinea, Indonesia, South Sudan, Democratic Republic of the Congo, Mozambique, Republic of the Congo, Brazil, Ukraine, Liberia, and Sierra Leone. Many of these countries have large, sparsely populated land reserves, but investors seldom focus on such areas. The target countries also typically display weak formal systems of land tenure, suggesting that certain investors see opportunities where existing land users have little legal protection. Further, many target countries have high rates of hunger – a fact that is especially troubling given that only one-third of the land deals focus on food crops.

Land deals should result from inclusive, transparent negotiations between governments, investors, and communities, including poor land users. Farmer working in a paddy field in Thailand. Photo: Denis Rozan/Shutterstock.com

European Union is a major player

The top investor countries include wealthy industrialized countries (for example the United States, United Kingdom), oil-rich Gulf states (United Arab Emirates, Saudi Arabia), and populous emerging economies (India, Malaysia). Small states with strong financial sectors (Singapore, Hong Kong) are also prominent. Collectively, the European Union is the source of a huge share of foreign investment. At over 8 million hectares (about the size of Austria) this share is even greater than that of the United States, whose investments cover roughly 6.5 million hectares (as big as the Irish Republic). China's significance has possibly been overestimated, as it is ranked 11th on the investor list – but it plays a big role in nearby Southeast Asia.

Large-scale land deals do not target idle land

In their analysis, CDE researchers selected a sample of 139 deals from the Land Matrix for which detailed locations were known, and overlaid it with geospatial information on land cover, population density, accessibility, yield gaps, and agricultural land use. They discovered that even when foreign investors target countries with relatively large, sparsely populated land reserves, their investments seldom focus on those areas where cultivable land is plentiful. Instead, investors typically seek land in accessible, populated areas where much of the land is already in use and pre-existing infrastructure (for example roads) may be exploited. Further, population density statistics near land deals suggest that tens of millions of people could be affected by the roughly 900 deals recorded in the Land Matrix.

Sustainable agricultural development?

Land deals are most likely to support sustainable, inclusive agricultural development if they help to close the gap between actual and potential productivity in areas where ample cultivable land is available. But the researchers' evidence suggests that many fail to do this,

Analyses show that investors prefer easily accessible and productive land, intensifying competition over the most attractive land. Tapping latex from a rubber tree in Phuket, Thailand. Photo: wandee007/shutterstock.com

and instead exacerbate resource competition. Indeed, 57 per cent of the deals in CDE's geospatial sample involved areas with high yield gaps but where the remaining cultivable land is relatively scarce. Rather than opening up new areas, foreign investors appear to prefer land in already cultivated areas. Local people or governments do not necessarily benefit: competition for scarce land rises, driving up prices and displacing residents. It may be better to invest directly in existing land users, helping them to improve their yields and sell their surplus via improved value chains. Doing so would fight rural poverty while generating wealth. Indeed, there are other promising business models with advantages over large-scale land acquisitions, one example being carefully devised contract-farming arrangements that involve no transfer of land rights.

Clear guidelines for better land investments exist

There is a general agreement that agricultural investment is urgently needed throughout the global South. It is not a question of if, but rather of how. Carefully considered principles and guidelines already exist, for example the Principles for Responsible Investment in Agriculture and Food Systems by the Committee on World Food Security of 2014. They highlight the need for transparency, inclusiveness, respect for human rights, and consideration of environmental costs in all land-related negotiations, contracts, and resulting projects. Such guidelines can provide a starting point for binding agreements between land investors, governments, and local communities. Every effort must be made to explain them to weaker stakeholders (especially poor land users), strengthen these actors in negotiations, and ensure that projects proceed only with their informed consent. Ongoing CDE research seeks to shed growing light on the context, impacts, and space for improvement of land investment, especially in Africa and Southeast Asia.

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Grazing livestock in Central Asia. Photo: Hanspeter Liniger, CDE

Collaboration for sustainable mountain development in Central Asia

Evaluation of a new game on pasture management by CAMP Alatoo. Photo: Bettina Wolfgramm, CDE

After gaining independence from the Soviet Union, the Central Asian republics lost access to the distribution channels for raw materials and goods produced in the planned economy – gas from Uzbekistan, aluminium from Tajikistan, meat from Kyrgyzstan, and more. At the same time, the republics were saddled with infrastructure in dire need of modernization. Under pressure to increase local production, highland farmers began using nearby fields and pastures more intensively. But overuse – due to lack of appropriate land management practices and land use regulations – in conjunction with harsh climatic conditions caused land degradation across the region. The interests of mountain regions supplying water and power came into conflict with those of the lowlands, where intensive agriculture and cotton production require huge amounts of irrigation water. The impacts of climate change, which strongly affect Central Asia, have compounded the situation. Extreme climate events such as heavy rainfall and dry spells have increased, and disasters such as floods, landslides, and debris flows – but also water shortages – are becoming more frequent. Natural resources are under increasing pressure, with degradation and biodiversity loss among the short and medium-term consequences aggravating poverty in rural areas of Central Asia.

CDE has worked for many years with partners in Kyrgyzstan and Tajikistan, including CAMP Alatoo, CAMP Kuhiston, and the Mountain Societies Research Institute. Together, they have helped to solve resource problems and supported the ongoing transformation towards more democracy and greater civil society participation. In their research, CDE and its regional partners focus on sustainable use of land and water, as well as on tools to support decision-making on land use planning. Long-term monitoring provides sound information on the challenges and potentials of sustainable natural resource use in the region. The aim is to identify current trends and, in collaboration with key stakeholders, to support promising developments in sustainable land management.

The partners

CAMP Alatoo and CAMP Kuhiston grew out of the Central Asia Mountain Partnership, a programme of the Swiss Agency for Development and Cooperation implemented by CDE in three Central Asian countries between 2000 and 2008. CAMP Alatoo was established in 2004 as an independent Kyrgyz NGO; today it features a staff of 30, an office in Bishkek, Kyrgyzstan, and a branch office, CAMP Tabiat, in Khorog, Tajikistan. CAMP Alatoo and CAMP Tabiat are known for innovatively tackling issues of natural resource management in collaboration with rural communities. CAMP Kuhiston was founded in Tajikistan in 2006, and is especially active in networks focused on mountain development.

The Mountain Societies Research Institute (MSRI) was set up in 2012 as an interdisciplinary research centre of the University of Central Asia (UCA). Prior to this, CDE had already established long-term cooperation with MSRI representatives: from 2008 to 2013, the Regional Coordination Office of the Swiss National Centre of Competence in Research (NCCR) North-South was based at UCA in Bishkek. MSRI is networked internationally and often carries out research projects together with the local populations, following the approach known as "citizen science". MSRI maintains a geodatabase for Central Asia that it set up together

Tajik farmer Rizoev Faizullo shows researchers his plough, which he constructed from scrap metal. Tractors are in short supply in Tajikistan. The few available ones are constantly in use, leaving some farmers unable to plant their fields on time. Photo: MSRI

with CDE. The geodatabase contains detailed spatial data, including digital terrain models and long-term observations of land use, and is an important resource for interdisciplinary research projects in the region.

Knowledge production for rural development

Today, CAMP Alatoo is known throughout Central Asia for its innovative workshops in the field of Learning for Sustainability (LforS), developed in collaboration with CDE. An important part of the LforS workshops are so-called strategy games: board games that enable participant players to better understand key pasture management problems and to test for possible solutions in a structured group setting. Which development investment should take priority: a road to the summer pastures or access to veterinary services? How are pastures rotated, and how long should cattle be kept in barns in the winter? Questions such as these have been addressed in the workshops by representatives of newly formed pasture committees. Workshops have been held in nearly 100 villages to date, and have been well received by local populations.

Dynamic platforms bringing together multiple stakeholders

Interdisciplinary study in Kyrgyzstan and Tajikistan is rare, as research institutes are strictly organized by discipline. MSRI is trying to promote interdisciplinarity: it supports young researchers who are working with local stakeholders and scientists from other disciplines on research questions that address local problems. Platforms that bring together stakeholders, policymakers, and practitioners have begun to grow in recent years. CAMP Alatoo and CAMP Kuhiston have created integrative platforms such as travelling exhibitions or the annual CAMP Forum. In addition, both organizations are strongly involved in civil society networks and are long-term partners of Mountain Partnership, whose Central Asian hub is housed by UCA. MSRI also cultivates exchange with various stakeholders, for example via its Internet-based knowledge platform MSRI Hub, a series of public lectures, and the Mobile Digital Library eBilim – a bus that visits remote villages and provides them with a link to the world of Internet-based knowledge.

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Natural resources are under increasing pressure in rural areas of Central Asia, leading to degradation and biodiversity loss. Photo: Yvo Weidmann

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Farmer selling fruit on a street market in the Philippines. Photo: Hanspeter Liniger, CDE

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Liniger, Hanspeter	PhD, geography (100%)
Lundsgaard-Hansen, Lara	MSc, geography (70%)
Mathez-Stiefel, Sarah-Lan	PhD, ethnobotany (35%)
Meessen, Heino	PhD, landscape ecology (70%)
Mekdaschi, Rima	PhD, agronomy (50%)
Moser, Stephanie	PhD, psychology (50%)
Nydegger, Katharina	BSc, geography (25%)
Oechslin, Lukas	BA, history (50%)
Ott, Cordula	MA, social anthropology (60%)
Paulsson, Maria	MSc, geography (50%)
Perlik, Manfred	Prof., geography (20%)
Providoli, Isabelle	PhD, geography (90%)
Roth, Vincent	MSc, geography (75%)
Scharrer, Bettina	MA, history (30%)
Schild, Kirstin	MA, philosophy (40%)
Schneider, Flurina	PhD, geography (80%)
Schober, Eva	BSc, geography (25%)
Schönweger, Oliver	MSc, geography (50%)
Stöckli, Bernhard	BSc, geography (25%)
Tejada, Laura	MSc, geography (50%)
Trechsel, Lilian	MSc, geography (70%)
Tschopp, Maurice	MSc, development studies (70%)
Vonlanthen, Lukas	MSc, geography (80%)
Weber, Adrian	MSc, geography (80%)
Weber, Anne-Kathrin	PhD, cartography and geoinformation (60%)
Wehrli, Judith	MA, law (15%)
Wolfgramm, Bettina	PhD, environmental engineering (80%)
Wymann, Susanne	MSc, geography (60%)
Zähringer, Julie	MSc, environmental sciences (75%)
Zimmermann, Anne	PhD, English languages and literatures (100%)

Services Unit Staff	
Name	**Fields of activity**
Balsiger, Nicole	Accounting and financial administration (45%)
Bamert, Seraina	Event and knowledge management (30%)
Eugster, Timm	Communications (10%)
Fedail, Ahmed	Web project management (100%)
Heierle, Emmanuel	ICT management (80%)
Hirschbuehl, Tina	Editing and translation (30%)
Jöhr, Franziska	Secretariat (80%)
Kummer, Simone	Graphic design (70%)
Lannen, Anu	Editing and translation (50%)
Lardelli, Corina	Communications (80%)
Meyer, Leandra	Publication management (15%)
Nussbaumer, Melchior	Secretariat (50%)
Staubesand, Iris	Communications (60%)
Thibault, Marlène	Editing and translation (100%)
Tresch, Jeannine	Secretariat and ICT management (60%)
Willi, Barbara	Human resources (60%)

*As at 31 December 2014

Participants of the IGS North-South Summer School 2014 in Kenya. Photo: Lilian Trechsel, CDE

CDE's PhD students at the International Graduate School (IGS) North-South in 2014*

Name	Working title of thesis	Funded by	Start of PhD	End of PhD
Alves Zanella, Matheus	Brazil–Mozambique development cooperation on food security and natural resource governance	Swiss Government Excellence Scholarships for Foreign Scholars	2014	2017
Anarbekov, Oyture	Irrigation management transfer: Questions of sustainability of Water User Associations (WUAs) in Ferghana Valley	International Water Management Institute; CDE; United Nations Economic Commission for Europe	2012	2015
Asnake, Mekuriaw	Assessment of the dynamics of soil and water conservation measures and land use change in the highlands of Ethiopia using remote sensing and GIS	Swiss National Science Foundation; Swiss Agency for Development and Cooperation	2010	2014
Augstburger, Horacio	Analysis of potentials and constraints of enhancing sustainable livelihoods in artisanal and small-scale gold mining in Bolivia, Peru, and Colombia through the forthcoming Mercury Convention	Swiss National Science Foundation	2013	2016
Bader, Christoph	Reaching the poorest: A multidimensional poverty profile for Lao PDR	CDE	2013	2015
Bär, Roger	Sustainable potentials for biomass fuel production in Kenya and Tanzania	Swiss National Science Foundation; Swiss Agency for Development and Cooperation	2013	2016
Bigler, Christine	Rural employment in export-led agricultural industries and its impacts on asset building and well-being in smallholder households: A comparative gender analysis	Swiss National Science Foundation; Swiss Agency for Development and Cooperation	2014	2017
Conradin, Katharina	World heritage sites and sustainable regional development	Self-funding; Swiss Alps Jungfrau-Aletsch UNESCO World Heritage Site; Swiss National Science Foundation; Swiss Agency for Development and Cooperation	2011	2014
Dakka, Abebe	Assessing soil-based ecological services and opportunities to sequester soil organic carbon in selected watersheds of Ethiopia	Self-funding; CDE	2010	2015
Faye, Papa	Managing the forest by the people: Constitutionality, citizenship and representation in two decentralization initiatives in Senegal's forestry sector	CDE; Institute of Social Anthropology, University of Bern	2011	2014
Frey, Sara	Analysis of negotiation processes around "vivir bien/ buen vivir" linking state-based and grassroots development initiatives	Swiss National Science Foundation	2013	2016
Gambon, Helen	Constitutionality processes and social-ecological outcomes in an indigenous territory in the Bolivian lowlands	Swiss National Science Foundation	2012	2015
Gargule, Andrew Achiba	Transformation without transition? The dynamics of pastoralism development in Northern Kenya	Swiss Government Excellence Scholarships for Foreign Scholars	2014	2017
Garrard, Rodney	Landscape dynamics in Sagarmatha (Mount Everest) National Park, Nepal: Impacts on selected environmental services and adaptive capacities	Commission for Research Partnerships with Developing Countries; CDE; European Outdoor Conservation Association; self-funding	2009	2015
Hergarten, Christian	Integrated assessment of land use systems' ecosystem services at the regional scale	Swiss National Science Foundation; Swiss Agency for Development and Cooperation	2009	2015
Jaquet, Stéphanie	Impacts of outmigration on land management in the mountain areas of Bolivia and Nepal	Swiss Network for International Studies	2012	2015
Jendoubi, Donia	Decision-support tool for assessing land degradation and realizing sustainable land management in the Watershed of Oued Madjerda, Tunisia	Islamic Development Bank; Swiss Government Excellence Scholarships for Foreign Scholars	2014	2017
Jucker, Matteo	The role of land management in preventing catastrophic shifts of dryland ecosystems	European Union Seventh Framework Programme	2012	2015
Kassawmar, Tibebu	Landscape transformation in Ethiopia: Spatio-temporal dynamics and implications on transboundary runoff and sediment yield in the Blue Nile Basin, Ethiopia	Swiss National Science Foundation; Swiss Agency for Development and Cooperation; CDE	2012	2015

Kongthong, Orasa	Interconnectedness between agrarian transformation and the water–energy–food security nexus in the Lower Mekong Basin using case studies in Thailand and Lao PDR	Swiss Government Excellence Scholarships for Foreign Scholars; self-funding	2013	2016
Lemann, Tatenda	The dynamics of "blue" and "green" water uses in the upper Blue Nile Basin in Ethiopia: Towards improved decision-making and transboundary negotiations	Swiss National Science Foundation; Swiss Agency for Development and Cooperation; CDE; Department of Integrative Geography, University of Bern	2012	2015
Linde, Lothar	The role of spatial decision support tools in advancing transparency and accountability of land management in the Greater Mekong Subregion	Self-funding; CDE	2014	2016
Nazarmavloev, Farrukh	A soil spectroscopy library and its application for assessing soil fertility in agricultural lands of Tajikistan	Swiss Government Excellence Scholarships for Foreign Scholars	2012	2015
Ochoa Garcia, Heliodoro	Geography of water, environmental conflicts, and social alternatives: The Santiago River watershed, Mexico	Jesuit University of Guadalajara, Mexico	2013	2016
Portner, Brigitte	Spatial impacts of biofuel crop production	Swiss National Science Foundation	2009	2015
Primasari, Nova	Dynamics of land use and stakes in Indonesia's peat lands and their impact on environmental services and local livelihoods: The case of Riau Province, Indonesia	Self-funding; CDE	2011	2015
Roth, Vincent	Discharge and erosion modelling in the upper Blue Nile Basin: Towards improved decision-making and transboundary negotiations	Swiss National Science Foundation; Swiss Agency for Development and Cooperation; CDE; Department of Integrative Geography, University of Bern	2012	2015
Schneider, Lysann	Why reforestation fails: Institutional change and migration in Colonia Yucatán, Mexico	Self-funding; Institute of Social Anthropology, University of Bern; CDE	2013	2015
Schönweger, Oliver	Key factors and processes shaping the implementation of large-scale land acquisitions	Swiss Network for International Studies; CDE	2012	2015
Shabdolov, Alisher	Improved governance of rangeland in the western Pamirs: Implications for common property management of scarce pasture resources in mountain regions	Swiss Government Excellence Scholarships for Foreign Scholars; University of Central Asia, Mountain Societies Research Institute	2012	2015
Subhatu, Alemtsehay	Impact of integrated watershed management on hydrology and sedimentology in small catchments of the Ethiopian highlands	Swiss Government Excellence Scholarships for Foreign Scholars	2013	2016
Tadele, Amare	Assessing the long-term impact of soil terracing on carbon sequestration in the highlands of Ethiopia	Swiss National Science Foundation; Swiss Agency for Development and Cooperation	2010	2014
Tejada, Laura	Large-scale land acquisitions in Peru: Effects on households in rural communities concerning gender relations, decision-making, and food security	Swiss Network for International Studies	2013	2016
Thanichanon, Puwadej	Effects of market integration on land use and welfare in Xayaburi Province, Lao PDR	Swiss National Science Foundation; Swiss Agency for Development and Cooperation	2009	2015
Tschopp, Maurice	Quinoa production in the Lipez Region, Bolivia: Asset accumulation and struggle for natural resources	Swiss National Science Foundation; Swiss Agency for Development and Cooperation	2014	2017
Zähringer, Julie	Cross-scale landscape service trade-offs in a conservation–development nexus along the north-eastern escarpment of Madagascar	CDE	2012	2015

*Includes IGS North-South students enrolled at the University of Bern and/or engaged in preparatory work for their PhDs at CDE in 2014

Terraced fields in Kaski District, Nepal. Photo: Stéphanie Jaquet, CDE

Programmes and mandates in 2014

Programmes and mandates by cluster	Budget size in 2014[1]	Main donors[2]	Countries/regions
Natural Resources and Ecosystem Services			
World Overview of Conservation Approaches and Technologies (WOCAT)	large	SDC	Global
Mandate to Support Countries in Recording Sustainable Land Management Best Practices	medium	UNCCD	Global
RECARE – Preventing and Remediating Degradation of Soils in Europe Through Land Care	medium	EU-FP7	Spain
Impacts of Outmigration on Land Management in the Mountain Areas of Bolivia and Nepal	small	SNIS	Bolivia, Nepal
Production of Instructional Videos for WOCAT	small	Stiftung Fons Margarita	Global
CASCADE – Catastrophic Shifts in Drylands	small	EU-FP7	Spain, Cyprus, Greece
Understanding Risk and Coping Strategies in Forest–Agriculture Landscapes	small	CIFOR	Laos
Knowledge Management for Integrated Watershed Management and Disaster Risk Reduction	medium	SDC	Tajikistan
Integrated Assessment of Land Use Systems' Ecosystem Services at the Regional Scale	small	SNSF and SDC (NCCR North-South)	Tajikistan
A Soil Spectroscopy Library and Its Application for Assessing Soil Fertility in Agricultural Lands of Tajikistan	small	FCS	Tajikistan
Improved Governance of Rangeland in the Western Pamirs: Implications for Common Property Management of Scarce Pasture Resources in Mountain Regions	small	FCS, UCA	Tajikistan
The Dynamics of "Blue" and "Green" Water Uses in the Upper Blue Nile Basin in Ethiopia: Towards Improved Decision-Making and Transboundary Negotiations	small	SNSF and SDC (NCCR North-South), CDE, DIG	Ethiopia
Discharge and Erosion Modelling in the Upper Blue Nile Basin: Towards Improved Decision-Making and Transboundary Negotiations	small	SNSF and SDC (NCCR North-South), CDE, DIG	Ethiopia
Cross-Scale Landscape Service Trade-Offs in a Conservation–Development Nexus Along the North-Eastern Escarpment of Madagascar	small	CDE	Madagascar
Impact of Integrated Watershed Management on Hydrology and Sedimentology in Small Catchments of the Ethiopian Highlands	small	FCS	Ethiopia
Assessing Soil-Based Ecological Services and Opportunities to Sequester Soil Organic Carbon in Selected Watersheds of Ethiopia	small	Student self-funding, CDE	Ethiopia
Decision-Support Tool for Assessing Land Degradation and Realizing Sustainable Land Management in the Watershed of Oued Madjerda, Tunisia	small	Islamic Development Bank, FCS	Tunisia
Multidimensional Disparities			
Lao DECIDE Info (Phase III)	large	SDC	Laos
Feminization, Agricultural Transition, and Rural Employment (FATE)	large	SNSF and SDC (r4d Programme)	Nepal, Laos, Rwanda, Bolivia
Resilient Agriculture-Based Livelihoods and Resilient Agricultural Landscapes? Adaptation to Climate Change in African Agriculture[3]	large	SNSF (Ambizione)	Tanzania, Kenya
Various Climate Mandates	medium	GIZ	India
Effects of Market Integration on Land Use and Welfare in Xayaburi Province, Lao PDR	small	SNSF and SDC (NCCR North-South)	Laos
Reaching the Poorest: A Multidimensional Poverty Profile for Lao PDR	small	CDE	Laos
Governance of Land and Natural Resources			
Water and Land Resource Centre (Phase II)	large	SDC	Ethiopia, Kenya
Sustainable Soil Governance and Large-Scale Land Acquisitions Originating in Switzerland	medium	SNSF (NRP 68)	Switzerland
The Importance of Sufficient Lifestyles for a Good Life	medium	Stiftung Mercator	Switzerland
Swiss Alpine Research	medium	SAJA UNESCO World Heritage	Switzerland

Increasing the Effectiveness of Transdisciplinary Research for Sustainable Development	small	SUC	Switzerland
Sense 21: Managing a Participatory Process for Local Inhabitants to Develop Their Vision of Future Use of the River Sense	small	Risikowissen	Switzerland
Fact Sheet on Trade in Hard and Soft Commodities	small	KFPE	Global
Large-Scale Land Acquisitions in Peru: Effects on Households in Rural Communities Concerning Gender Relations, Decision-Making, and Food Security	medium	SNIS	Peru
The Cultural Dimension of Sustainable Regional and Landscape Development	small	SERI	Switzerland
Thematic Synthesis on Sustainable Water Governance: Challenges and Approaches	medium	SNSF (NRP 61)	Switzerland
Spatial Impacts of Biofuel Crop Production	small	SNSF (ProDoc)	Ethiopia
World Heritage Sites and Sustainable Regional Development	small	Student self-funding, SAJA UNESCO World Heritage, SNSF and SDC (NCCR North-South)	Switzerland
Dynamics of Land Use and Stakes in Indonesia's Peat Lands and Their Impact on Environmental Services and Local Livelihoods: The Case of Riau Province, Indonesia	small	Student self-funding, CDE	Indonesia
Managing the Forest by the People: Constitutionality, Citizenship and Representation in Two Decentralization Initiatives in Senegal's Forestry Sector	small	CDE, Institute of Social Anthropology, University of Bern	Senegal
Irrigation Management Transfer: Questions of Sustainability of Water User Associations (WUAs) in Ferghana Valley	small	IWMI, CDE, UNECE	Kyrgyzstan, Uzbekistan
Constitutionality Processes and Social-Ecological Outcomes in an Indigenous Territory in the Bolivian Lowlands	small	SNSF (ProDoc)	Bolivia
Analysis of Negotiation Processes Around "Vivir Bien/Buen Vivir" Linking State-Based and Grassroots Development Initiatives	small	SNSF (ProDoc)	Bolivia
Geography of Water, Environmental Conflicts, and Social Alternatives: The Santiago River Watershed, Mexico	small	ITESO	Mexico
Why Reforestation Fails: Institutional Change and Migration in Colonia Yucatán, Mexico	small	Student self-funding, Institute of Social Anthropology, University of Bern, CDE	Mexico
Brazil–Mozambique Development Cooperation on Food Security and Natural Resource Governance	small	FCS	Brazil, Mozambique
Transformation Without Transition? The Dynamics of Pastoralism Development in Northern Kenya	small	FCS	Kenya, Tanzania
The Regulation of Trade in Goods from Conflict Zones	small	SECO	Zimbabwe
Churches as Agents in Sustainable Development Projects: The Case of Indonesia[4]	small	SNSF	Indonesia
Global Change Impacts			
Backstopping Mandate on Environment and Development	large	SDC	Global
Mountain Research and Development (MRD) International Scientific Journal	large	CDE, ICIMOD, IMS, SDC, others	Global
Knowledge Management for Sustainable Development in Mountain Areas	large	ADA	Global
Sustainable Mountain Development for Global Change	large	SDC	Global
Economics of Land Degradation Initiative	large	GIZ	Ethiopia
Development of Nature Conservation and of Protected Areas in the Slovak Carpathians	medium	SDC, Swiss EU Enlargement Contribution	Slovakia
Landscape Dynamics in Sagarmatha (Mount Everest) National Park, Nepal: Impacts on Selected Environmental Services and Adaptive Capacities	small	KFPE, CDE, EOCA, student self-funding	Nepal
Landscape Transformation in Ethiopia: Spatio-Temporal Dynamics and Implications on Transboundary Runoff and Sediment Yield in the Blue Nile Basin, Ethiopia	small	SNSF and SDC (NCCR North-South), CDE	Ethiopia

Interconnectedness Between Agrarian Transformation and the Water–Energy–Food Security Nexus in the Lower Mekong Basin Using Case Studies in Thailand and Lao PDR	small	FCS, student self-funding	Thailand, Laos
Nepal Goes Nuts: The Potential of Nut Cultivation for Contributing to Sustainable Livelihoods, Economic Development, and Local Ecosystem Improvements in Rural Nepal	small	Helvetas Swiss Intercooperation	Nepal
The Role of Spatial Decision Support Tools in Advancing Transparency and Accountability of Land Management in the Greater Mekong Subregion	small	Student self-funding, CDE	Myanmar, Laos
Atlas on Sustainable Artisanal Mining in Mongolia	small	SDC	Mongolia
Bahr el Ghazal River Basin Management Project	medium	SDC	Sudan
Rehabilitation of Irrigation Schemes in Wetlands of Liberia	small	SDC	Liberia
Innovations for Sustainable Development			
Eastern and Southern Africa Partnership Programme (ESAPP)	large	SDC	Ethiopia, Kenya, Tanzania, Madagascar, Eritrea
The Prospects of Pro-Poor Biomass Energy Value Chains in Rural–Urban Contexts in East Africa	large	SNSF and SDC (r4d Programme)	Kenya, Tanzania
The Agrobiodiversity Initiative (Phase II)	medium	SDC	Laos
E-Scooters Research Project	small	SFOE, FEDRO	Switzerland
Research Innovations	small	HES-SO	Switzerland
Awareness and Action in the Fight Against Noise Pollution	small	FOEN	Switzerland
Transforming Tanzania's Charcoal Sector	medium	SDC	Tanzania
Education for Sustainable Development			
International Graduate School (IGS) North-South	medium	University of Bern	Global
IGS North-South Summer School 2014	medium	University of Bern, CDE, KFPE	Kenya
Language Compass on Landscape and Environment: How Language Shapes Our Perception of Landscape and Nature	medium	5i Förderorganisation, Bristol-Stiftung	Switzerland
Integration of Sustainable Development in Curricula	small	University of Bern, SUC	Switzerland
Updating and Optimizing the Map of Erosion Risks in Swiss Agricultural Areas	small	FOAG	Switzerland
Bernese Award for Environmental Research	small	University of Bern, others	Global
Certificate of Advanced Studies in Sustainable Development	medium	Course fees, others	Switzerland
Various teaching mandates, e.g. Zurich University of Applied Sciences, NADEL/ETH Zurich, University of Lucerne	small	Various academic institutions	Switzerland

[1] Budget share managed by CDE: small = up to CHF 50,000; medium = CHF 50,001 to 150,000; large = CHF 150,001 and more

[2] Specific funding programmes are mentioned in brackets, if applicable

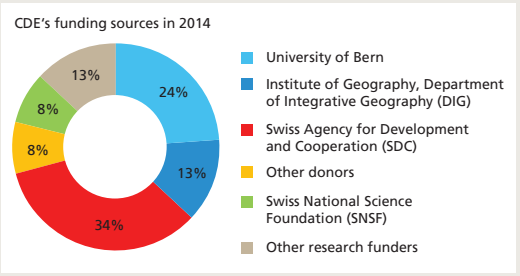
[3] Project of the Department of Integrative Geography that is of strategic importance to CDE

[4] Project implemented by the Institute of Social Anthropology and the Institute of History that is of strategic importance to CDE

Acronyms and abbreviations: ADA = Austrian Development Agency; CDE = Centre for Development and Environment, University of Bern; CIFOR = Center for International Forestry Research; DIG = Department of Integrative Geography, University of Bern; EOCA = European Outdoor Conservation Association; EU = European Union; EU-FP7 = European Union Seventh Framework Programme; FCS = Swiss Government Excellence Scholarships for Foreign Scholars; FEDRO = Federal Roads Office; FOAG = Federal Office for Agriculture; FOEN = Federal Office for the Environment; GIZ = Deutsche Gesellschaft für Internationale Zusammenarbeit; HES-SO = University of Applied Sciences and Arts Western Switzerland; ICIMOD = International Centre for Integrated Mountain Development; IMS = International Mountain Society; ITESO = Jesuit University of Guadalajara, Mexico; IWMI = International Water Management Institute; KFPE = Swiss Commission for Research Partnerships with Developing Countries; NCCR = National Centre of Competence in Research; NRP = National Research Programme; ProDoc = Doctoral Programme; r4d Programme = Swiss Programme for Research on Global Issues for Development; SAJA UNESCO World Heritage = Swiss Alps Jungfrau-Aletsch UNESCO World Heritage Site; SDC = Swiss Agency for Development and Cooperation; SECO = State Secretariat for Economic Affairs; SERI = State Secretariat for Education, Research and Innovation; SFOE = Swiss Federal Office of Energy; SNIS = Swiss Network for International Studies; SNSF = Swiss National Science Foundation; SUC = Swiss University Conference; UCA = University of Central Asia; UNCCD = United Nations Convention to Combat Desertification; UNECE = United Nations Economic Commission for Europe; UNESCO = United Nations Educational, Scientific and Cultural Organization.

Fishermen in Laos. Photo: Susanne Wymann, CDE

Finances



Shares of funding sources for CDE's activities and services in 2014.

Funding source	Amount (in CHF)
University of Bern	2,520,700
Institute of Geography, Department of Integrative Geography (DIG)	1,290,200
Swiss Agency for Development and Cooperation (SDC)	3,565,400
Other donors	842,800
Swiss National Science Foundation (SNSF)	818,500
Other research funders	1,373,400
Total	**10,411,000**

Sources of funding for CDE's activities and services in 2014, including CHF 2.4 million of funds entrusted to CDE for projects in its partner regions.

Financial account for 2014 (in CHF, rounded)

INCOME	Total	CDE	DIG[1]
External funds			
Programme income	4,149,500	4,149,500	
Other income (services)	50,300	50,300	
Total external funds	*4,199,800*	*4,199,800*	
University funds			
Contribution to office rent[2]	200,000	100,000	100,000
Contribution to personnel expenditure	3,022,800	1,891,700	1,131,100
Contribution to operating expenses	588,100	529,000	59,100
Total university funds	*3,810,900*	*2,520,700*	*1,290,200*
Total income	**8,010,700**	**6,720,500**	**1,290,200**
EXPENDITURE	**Total**	**CDE**	**DIG**
Personnel			
Salaries	5,889,000	4,969,400	919,600
Social benefits	1,366,100	1,154,600	211,500
Total personnel	*7,255,100*	*6,124,000*	*1,131,100*
Other expenditure			
Office rent	220,000	120,000	100,000
Office operating expenses	349,900	290,800	59,100
Travel	98,500	98,500	
Miscellaneous	48,700	48,700	
IT (CDE share)	213,500	213,500	
Total other expenditure	*930,600*	*771,500*	*159,100*
Accruals	**-175,000**	**-175,000**	
Total expenditure	**8,010,700**	**6,720,500**	**1,290,200**

All accounts were audited externally and internally and were approved.

[1] Department of Integrative Geography; the financial account of DIG is listed here because its accounting is done by CDE owing to the large number of jointly run projects and programmes

[2] Paid directly by the university administration

Balance sheet as at 31 December 2014 (in CHF, rounded)

ASSETS	
Current assets	
Liquid funds, CDE	194,500
Accounts, university	540,600
Accounts receivable	2,084,800
Advances	18,500
Total current assets	*2,838,400*
Fixed assets	
EDP equipment	0
Total fixed assets	*0*
Prepaid expenses	361,300
Total assets	**3,199,700**
LIABILITIES	
Current liabilities	
Accounts payable	152,900
Project funds	502,800
Total current liabilities	*655,700*
Equity capital	
Capital[1]	699,300
General reserves[2]	901,800
Tied reserves[3]	942,900
Total equity capital	*2,544,000*
Total liabilities	**3,199,700**

[1] Equity capital at date of establishment of CDE as an interdisciplinary research centre in mid-2009
[2] Accumulated gains and losses from previous years
[3] Reserved for severance payments and special research

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